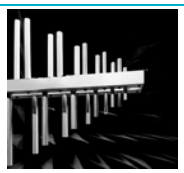
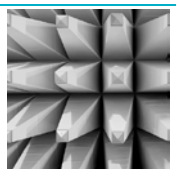




CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-2339/21-01-58

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Robert Bosch GmbH
Robert-Bosch-Platz 1
70839 Gerlingen / GERMANY
Contact: Thomas Dargel
e-mail: Thomas.Dargel@de.bosch.com
Phone: +49 5121 49-5599

Manufacturer

Bosch Car Multimedia Portugal, S.A
Rua Max Grundig, 35-Lomar
4705-820 Braga /PORTUGAL

Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Radio System**
Model name:	**PSA AIO**
FCC ID:	**2AUXS-PSAAIO**
IC:	**25847-PSAAIO**
Frequency:	5725 MHz to 5850 MHz
Technology tested:	WLAN
Antenna:	Integrated antenna
Power supply:	9 V to 16 V DC by external power supply / vehicle battery
Temperature range:	-30°C to +70°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Marco Bertolino, o=CTC advanced GmbH, ou=BTL-161128, email=Marco.Bertolino@ctcadvanced.com, c=DE
2021.07.22 11:01:37 +02'00'

Marco Bertolino
Lab Manager
Radio Communications

Test performed:

cn=Rene Oelmann, o=CTC advanced GmbH, ou=OEL-171123, email=rene.oelmann@ctcadvanced.com, c=DE
2021.07.22 11:02:53 +02'00'

Rene Oelmann
Lab Manager
Radio Communications

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.
All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH.
In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2021-04-27
Date of receipt of test item:	2021-06-07
Start of test:*	2021-06-08
End of test:*	2021-06-24
Person(s) present during the test:	-/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

None

3 Test standard/s, references and accreditations

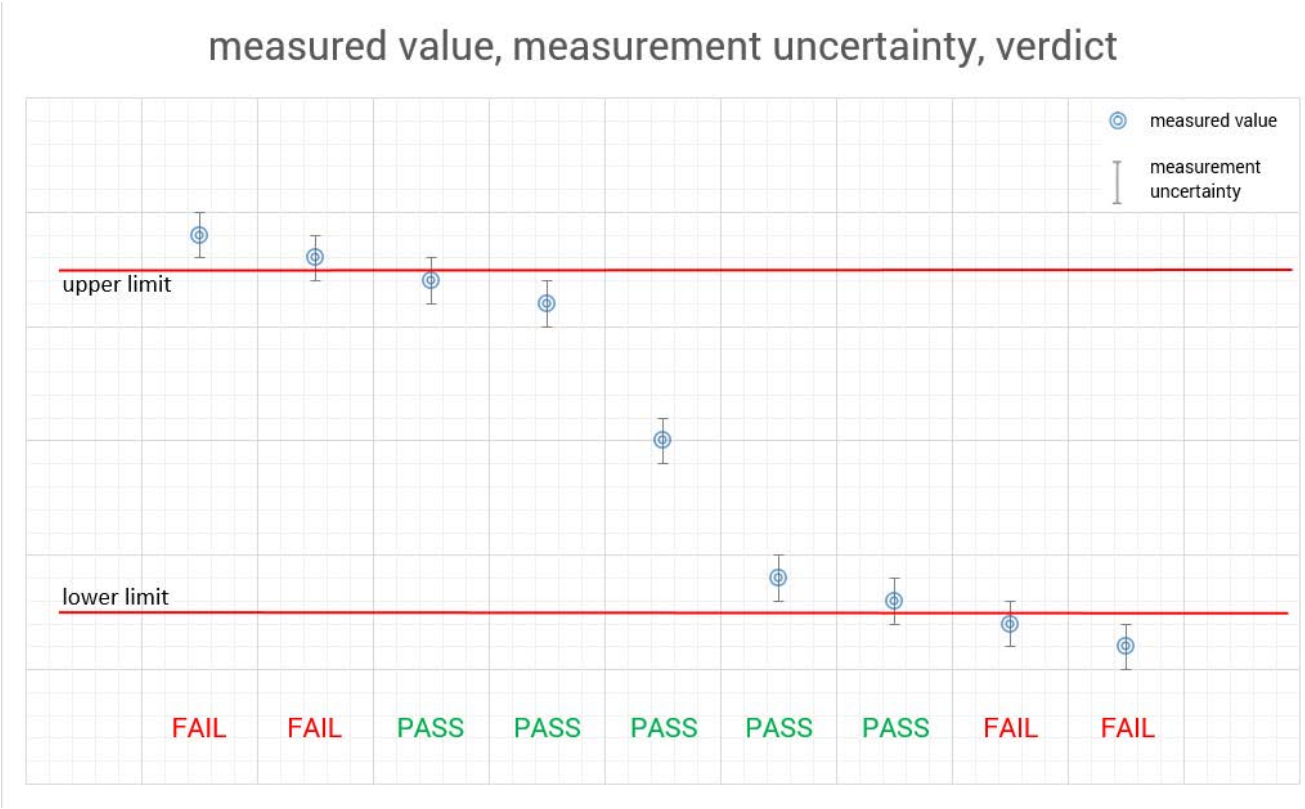
Test standard	Date	Description
FCC - Title 47 CFR Part 15	-/-	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5 incl. Amendment 1 & 2	February 2021	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
KDB 789033 D02	v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
ANSI C63.4-2014	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests No tests under extreme conditions required. No tests under extreme conditions required.
Relative humidity content	:		48 %
Barometric pressure	:		1016 hpa
Power supply	:	V_{nom} V_{max} V_{min}	13.5 V DC by external power supply / vehicle battery No tests under extreme conditions required. No tests under extreme conditions required.

6 Test item

6.1 General description

Kind of test item	:	Radio System
Model name	:	PSA AIO
HMN	:	-/-
PMN	:	MyCitroën Play
HVIN	:	HW06
FVIN	:	9694865580
S/N serial number	:	Conducted: 815RB0306M0003084 Radiated: 815RB0306M0003062
Hardware status	:	C2 sample reworked (radiated sample) ; C2 sample (conducted sample)
Software status	:	-/-
Firmware status	:	9694865580
Frequency band	:	5725 MHz to 5850 MHz
Type of radio transmission Use of frequency spectrum	: :	OFDM
Type of modulation	:	(D)QPSK, 16 – QAM, 64 – QAM
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	9 V to 16 V DC by external power supply / vehicle battery
Temperature range	:	-30°C to +70°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-2339/21-01-01_AnnexA
1-2339/21-01-01_AnnexB
1-2339/21-01-01_AnnexD

7 Sequence of testing

7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

7.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

8 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

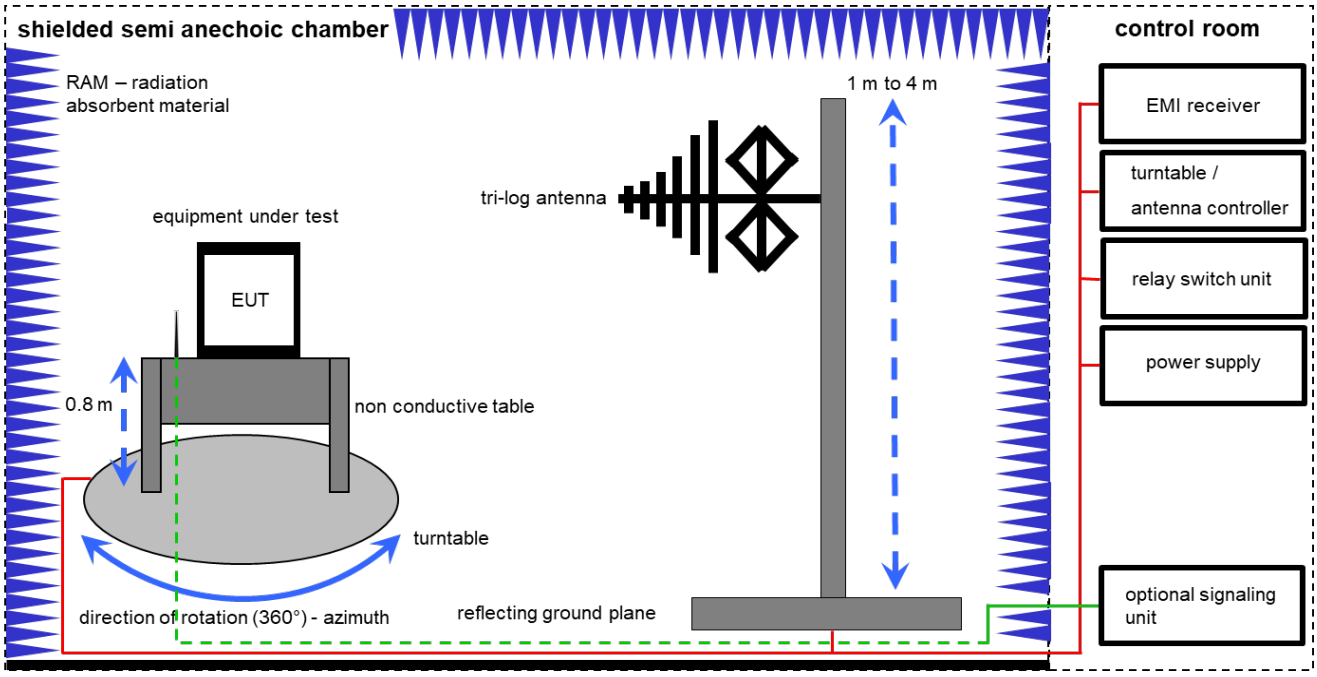
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

8.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter; EMC32 software version: 10.59.00

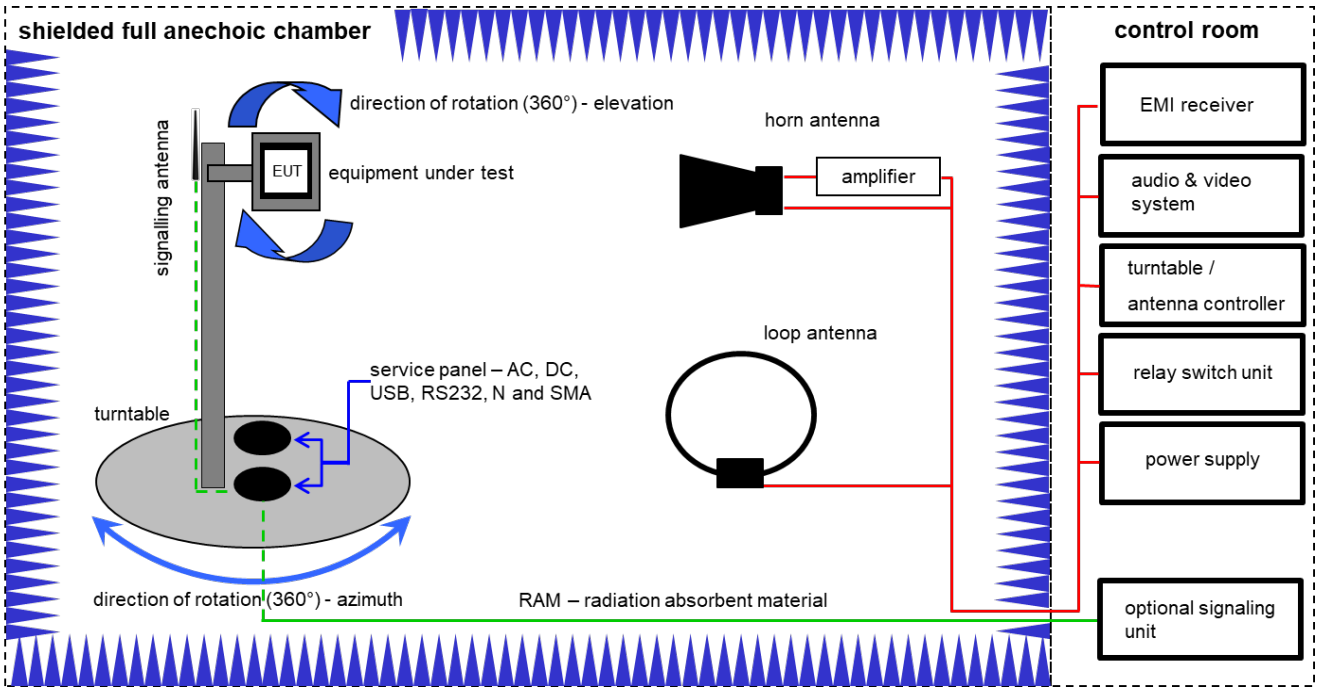
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Semi anechoic chamber	3000023	MWB AG	-/-	300000551	ne	-/-	-/-
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
5	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	318	300003696	vlKl!	04.09.2019	03.09.2021
7	A	Turntable	2089-4.0	EMCO	-/-	300004394	ne	-/-	-/-
8	A	PC	TecLine	F+W	-/-	300004388	ne	-/-	-/-
9	A	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	10.12.2020	09.06.2022

8.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter / 1 meter

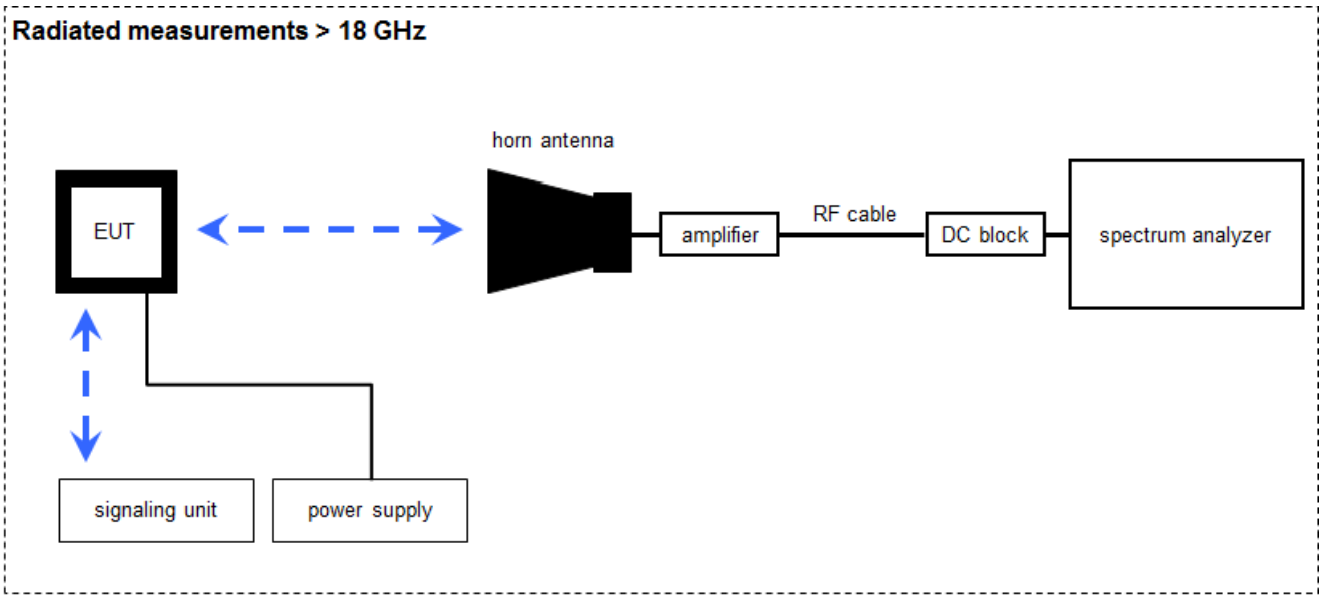
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	C	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vlKl!	13.06.2019	12.06.2022
2	A, B, C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A, B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vlKl!	12.03.2021	11.03.2023
4	A, B, C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
5	B	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
6	A, B, C	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2020	10.12.2021
7	B	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	B	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
10	A, B, C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
11	A, B, C	NEXIO EMV-Software	BAT EMC V3.20.0.17	EMCO	-/-	300004682	ne	-/-	-/-
12	A, B, C	PC	ExOne	F+W	-/-	300004703	ne	-/-	-/-
13	B	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-

8.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

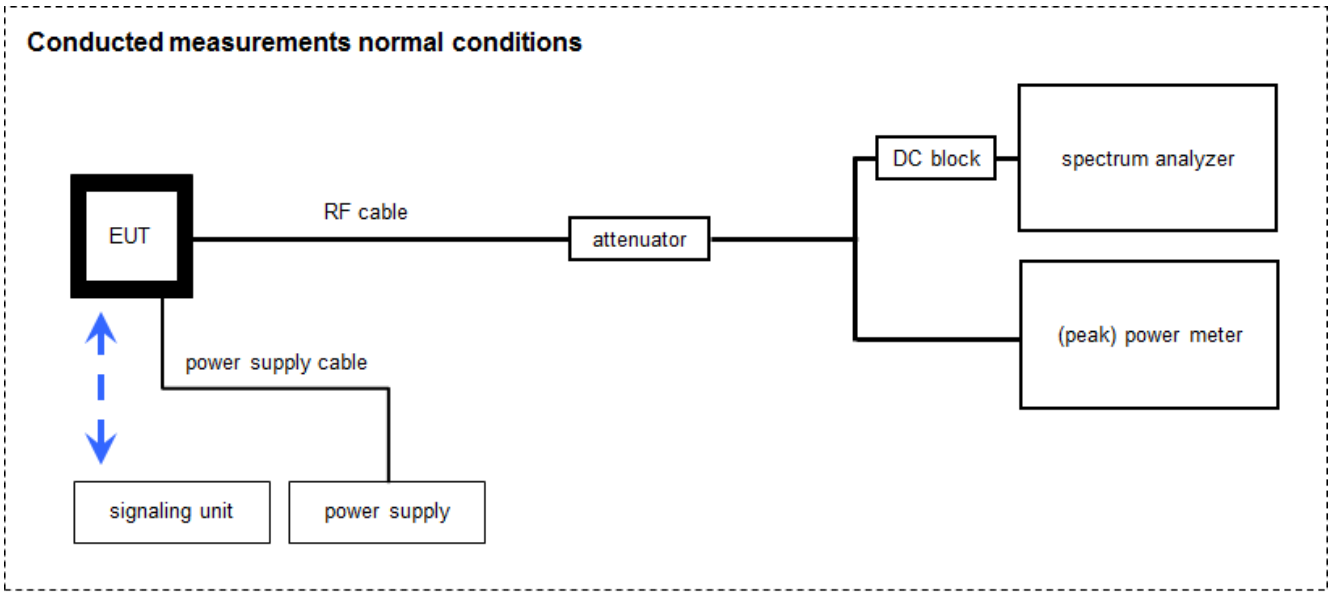
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP	00419	300002268	ev	-/-	-/-
2	A	Std. Gain Horn Antenna 18.0-26.5 GHz	638	Narda	01096	300000486	vlKl!	21.01.2020	20.01.2022
3	A	Signal Analyzer 40 GHz	FSV40	Rohde & Schwarz	101042	300004517	k	07.12.2020	06.12.2021
4	A	RF-Cable	ST18/SMAm/SMAm /48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
5	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
6	A	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	82-16	300000510	vlKl!	23.01.2020	22.01.2022
7	A	Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273	ev	-/-	-/-

8.4 Conducted measurements with peak power meter & spectrum analyzer



WLAN tester version: 1.1.13; LabView2015

OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal Analyzer 40 GHz	FSV40	Rohde & Schwarz	101042	300004517	k	07.12.2020	06.12.2021
2	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
3	A	RF-Cable	ST18/SMAm/SMAm /60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
4	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	-/-	400001186	ev	-/-	-/-
5	A	Synchron Power Meter	SPM-4	CTC	1	300005580	ev	-/-	-/-
6	A,	Tester Software RadioStar (C.BER2 for BT Conformance)	Version 1.0.0.X	CTC advanced GmbH	0001	400001380	ne	-/-	-/-

9 Measurement uncertainty

Measurement uncertainty		
Test case	**Uncertainty**	
Antenna gain	± 3 dB	
Power spectral density	± 1.56 dB	
DTS bandwidth	± 100 kHz (depends on the used RBW)	
Occupied bandwidth	± 100 kHz (depends on the used RBW)	
Maximum output power conducted	± 1.56 dB	
Detailed spurious emissions @ the band edge - conducted	± 1.56 dB	
Band edge compliance radiated	± 3 dB	
Spurious emissions conducted	> 3.6 GHz	± 1.56 dB
	> 7 GHz	± 1.56 dB
	> 18 GHz	± 2.31 dB
	≥ 40 GHz	± 2.97 dB
Spurious emissions radiated below 30 MHz	± 3 dB	
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB	
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB	
Spurious emissions radiated above 12.75 GHz	± 4.5 dB	
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB	

10 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Title 47 Part 15 RSS 247, Issue 2	See table	2021-07-22	-/-

Test specification clause	Test case	C	NC	NA	NP	Remark
-/-	Output power verification (cond.)	-/-				-/-
-/-	Antenna gain	-/-				-/-
U-NII Part 15	Duty cycle	-/-				-/-
§15.407(a) RSS - 247 (6.2.x.1)	Maximum output power (conducted & radiated)	☒	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.x.1)	Power spectral density	☒	☐	☐	☐	-/-
RSS - 247 (6.2.4.1)	Spectrum bandwidth 6dB bandwidth	☒	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.x.2)	Spectrum bandwidth 26dB bandwidth	☒	☐	☐	☐	-/-
RSS Gen clause 6.6	Spectrum bandwidth 99% bandwidth	-/-				-/-
§15.205 RSS - 247 (6.2.x.2)	Band edge compliance radiated	☐	☐	☒	☐	-/-
§15.407(b) RSS - 247 (6.2.x.2)	TX spurious emissions radiated	☒	☐	☐	☐	-/-
§15.209(a) RSS-Gen	Spurious emissions radiated < 30 MHz	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Spurious emissions conducted emissions< 30 MHz	☐	☐	☒	☐	-/-
§15.407 RSS - 247 (6.3)	DFS	☐	☐	☒	☐	-/-

Notes:

C:	Compliant	NC:	Not compliant	NA:	Not applicable	NP:	Not performed

11 Additional comments

Reference documents: 1-2339_21-01-58_Annex_MR_A_1.pdf

Special test descriptions: None

Configuration descriptions: None

EUT selection: ☒ Only one device available

☐ Devices selected by the customer

☐ Devices selected by the laboratory (Randomly)

Provided channels:

Channels with 20 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency								
channel	36	40	44	48	52	56	60	64
f_c / MHz	5180	5200	5220	5240	5260	5280	5300	5320

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency											
channel	100	104	108	112	116	120	124	128	132	136	140
f_c / MHz	5500	5520	5540	5560	5580	5600	5620	5640	5660	5680	5700

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency					
channel	**149**	153	157	161	165
f_c / MHz	**5745**	5765	5785	5805	5825

Channels with 40 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency				
channel	38	46	54	62
f_c / MHz	5190	5230	5270	5310

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency					
channel	102	110	118	126	134
f_c / MHz	5510	5550	5590	5630	5670

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency		
channel	**151**	159
f_c / MHz	**5755**	5795

Channels with 80 MHz channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency		
channel	42	58
f_c / MHz	5210	5290

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency		
channel	106	122
f_c / MHz	5530	5610

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency	
channel	**155**
f_c / MHz	**5775**

Note: The channels used for the tests were marked in bold in the list.

Test mode:

☐ No test mode available.
Iperf is used to transmit data to a companion device

☒ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)
- Equipment with 1 antenna,
- Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,
- Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)

☐ Operating mode 2 (multiple antennas, no beamforming)
- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.

☐ Operating mode 3 (multiple antennas, with beamforming)
- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

12 Measurement results

12.1 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average power meter to identify the maximum transmission power on mid channel. In the case that only one or two channels are available, only these will be measured.

In further tests only the identified worst case modulation scheme or bandwidth will be measured.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max hold
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Results:

OFDM – mode	Modulation scheme / bandwidth					
	U-NII-1 & U-NII-2A		U-NII-2C		U-NII-3	
	lowest channel	highest channel	lowest channel	highest channel	lowest channel	highest channel
a – mode	Mbit/s	Mbit/s	Mbit/s	Mbit/s	6 Mbit/s	Mbit/s
n/ac HT20 – mode	MCS	MCS	MCS	MCS	MCS0	MCS
n/ac HT40 – mode	MCS	MCS	MCS	MCS	MCS0	MCS
ac VHT80 – mode	MCS	MCS	MCS	MCS	MCS0	MCS

12.2 Antenna gain

Description:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Measurement parameters:

Measurement parameter	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf Peak OP 3MHz/3MHz
Test setup:	See chapter 8.2 setup A (radiated) See chapter 8.4 setup A (conducted)
Measurement uncertainty:	See chapter 9

Limits:

Antenna Gain
6 dBi / > 6 dBi output power and power density reduction required

Results:

U-NII-3 (5725 MHz to 5850 MHz)	Antenna gain		
	Lowest channel	Middle channel	Highest channel
Conducted power / dBm @ 3 MHz RBW	10.2		
Radiated power / dBm @ 3 MHz RBW	14.5		
Gain / dBi (calculated or declared)	4.3		

12.3 Duty cycle

Description:

The duty cycle is necessary to compute the maximum power during an actual transmission. The shown plots and values are to show an example of the measurement procedure. The real value is measured direct during the power measurement or power density measurement. The correction value is shown in each plot of these measurements.

Measurement:

Measurement parameter	
According to: KDB789033 D02, B.	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 Max Output Power and PSD
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Results:

Duty cycle and correction factor:

OFDM – mode	Calculation method	
	T_{on} ($D2_{plot}$) * 100 / $T_{complete}$ ($D3_{plot}$) = duty cycle 10 * log(duty cycle) = correction factor	
	Duty cycle	Correction factor
a – mode	33%	4.8 dB
n/ac HT20 – mode	32%	4.9 dB
n/ac HT40 – mode	18%	7.4 dB
ac VHT80 – mode	8.3%	10.8 dB

12.4 Maximum output power

12.4.1 Maximum output power according to FCC requirements

Description:

Measurement of the maximum output power conducted

Measurement:

Measurement parameter	
According to: KDB789033 D02, E.2.e.	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 Max Output Power and PSD
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

Radiated output power	Conducted output power for mobile equipment
Conducted power + 6 dBi antenna gain	250mW 5.150-5.250 GHz The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 26dB Bandwidth [MHz]) 1W 5.725-5.85 GHz

Results:

a	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	8.2		

Results:

n/ac HT20	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	7.7		

Results:

n/ac HT40	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel		Highest channel
	3.2		

Results:

ac VHT80	Maximum output power conducted [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Middle channel		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Middle channel		
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel		Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Middle channel		
	3.5		

12.4.2 Maximum output power according to ISED requirements

Description:

Measurement of the maximum output power conduced + radiated

Measurement:

Measurement parameter	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf ISED Max Output Power and PSD
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

Radiated output power	Conducted output power for mobile equipment
The lesser one of 200 mW or 10 dBm + 10 log Bandwidth 5.150-5.250 GHz 1 W or 17 dBm + 10 log Bandwidth 5.250-5.350 GHz 1 W or 17 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) Conducted power + 6dBi antenna gain 5.725-5.825 GHz	The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) 1W 5.725-5.825 GHz

Results:

a	Maximum output power [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	8.2		
	Radiated (calculated – see chapter antenna gain)		
	12.5		

Results:

n/ac HT20	Maximum output power [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	7.7		
	Radiated (calculated – see chapter antenna gain)		
	12.0		

Results:

n/ac HT40	Maximum output power [dBm]		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	3.1		
	Radiated (calculated – see chapter antenna gain)		
	7.4		

Results:

ac VHT80	Maximum output power [dBm]	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	Conducted	
	Radiated (calculated – see chapter antenna gain)	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	Conducted	
	Radiated (calculated – see chapter antenna gain)	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	Conducted	
	Radiated (calculated – see chapter antenna gain)	
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	Conducted	
	3.5	
	Radiated (calculated – see chapter antenna gain)	
	7.8	

12.5 Power spectral density

12.5.1 Power spectral density according to FCC requirements

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to: KDB789033 D02, F.	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 Max Output Power and PSD
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

Power Spectral Density
power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5150 – 5250 MHz)
power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5250 – 5350 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5470 – 5725 MHz)
power spectral density conducted ≤ 30 dBm in any 500 kHz band (band 5725 – 5850 MHz)

Results:

a	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	-5.9		

Results:

n/ac HT20	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	-6.6		

Results:

n/ac HT40	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	-13.9		

Results:

ac VHT80	Power spectral density (dBm/1MHz or dBm/500kHz)	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	-17.1	

12.5.2 Power spectral density according to ISED requirements

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf ISED Max Output Power and PSD
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

Power Spectral Density
power spectral density e.i.r.p. ≤ 10 dBm in any 1 MHz band (band 5150 – 5250 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5250 – 5350 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5470 – 5725 MHz) power spectral density conducted ≤ 30 dBm in any 500 kHz band (band 5725 – 5850 MHz)

Results:

a	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	-5.9		

Results:

n/ac HT20	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	-6.6		

Results:

n/ac HT40	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	-13.9		

Results:

ac VHT80	Power spectral density (dBm/1MHz or dBm/500kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Middle channel		
	Conducted		
	Radiated (calculated – see chapter antenna gain)		
	U-NII-2A (5250 MHz to 5350 MHz)		
	Middle channel		
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Highest channel	
	U-NII-3 (5725 MHz to 5850 MHz)		
	Middle channel		
	-17.1		

12.6 Minimum emission bandwidth for the band 5.725-5.85 GHz

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.2.	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 & ISED Minimum Emission BW
Used test setup:	See chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

FCC	ISED
The minimum 6 dB bandwidth shall be at least 500 kHz.	

Results:

a	6 dB emission bandwidth (MHz)		
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	16.35		

Results:

n/ac HT20	6 dB emission bandwidth (MHz)		
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	17.55		

Results:

n/ac HT40	6 dB emission bandwidth (MHz)	
	U-NII-3 (5725 MHz to 5850 MHz)	
	Lowest channel	Highest channel
	35.5	

Results:

ac VHT80	6 dB emission bandwidth (MHz)
	U-NII-3 (5725 MHz to 5850 MHz)
	Middle channel
	76.0

12.7 Spectrum bandwidth / 26 dB bandwidth

Description:

Measurement of the 26 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.1.	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 & ISED Bandwidths
Used test setup:	see chapter 8.4 setup A
Measurement uncertainty:	See chapter 9

Limits:

Spectrum Bandwidth – 26 dB Bandwidth
IC: Any unwanted emissions that fall into the band 5250-5350 MHz shall be attenuated below the channel power by at least 26 dB, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 MHz. The 26 dB bandwidth may fall into the 5250-5350 MHz band; however, if the occupied bandwidth also falls within the 5250-5350 MHz band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 MHz including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 MHz band. **FCC:** Radar Detection Function of Dynamic Frequency Selection (DFS). U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

Results:

a	26 dB bandwidth (MHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Lowest frequency	Highest frequency	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	20050		
	Lowest frequency	Highest frequency	
	5734.85		

Results:

n/ac HT20	26 dB bandwidth (MHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	Lowest frequency	Highest frequency	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	20.1		
	Lowest frequency	Highest frequency	
	5734.85		

Results:

n/ac HT40	26 dB bandwidth (MHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	Lowest frequency	Highest frequency	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	40.6		
	Lowest frequency	Highest frequency	
	5734.7		

Results:

ac VHT80	26 dB bandwidth (MHz)	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	Lowest frequency	Highest frequency
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	81400	
	Lowest frequency	Highest frequency
	5734.4	5815.8

12.8 Occupied bandwidth / 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement:

Measurement parameter	
External result file(s)	1-2339_21-01-58_Annex_MR_A_1.pdf FCC Part 15.407 & ISED Bandwidths
Test setup:	See sub clause 8.4 setup A
Measurement uncertainty:	See chapter 9

Usage:

-/-	ISED
OBW is necessary for Emission Designator	

Results:

a	99% bandwidth (kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	16783		

Results:

n/ac HT20	99% bandwidth (kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Middle channel	Highest channel
	17682		

Results:

n/ac HT40	99% bandwidth (kHz)		
	U-NII-1 (5150 MHz to 5250 MHz)		
	Lowest channel	Highest channel	
	U-NII-2A (5250 MHz to 5350 MHz)		
	Lowest channel	Highest channel	
	U-NII-2C (5470 MHz to 5725 MHz)		
	Lowest channel	Middle channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)		
	Lowest channel	Highest channel	
	36263		

Results:

ac VHT80	99% bandwidth (kHz)	
	U-NII-1 (5150 MHz to 5250 MHz)	
	Middle channel	
	U-NII-2A (5250 MHz to 5350 MHz)	
	Middle channel	
	U-NII-2C (5470 MHz to 5725 MHz)	
	Lowest channel	Highest channel
	U-NII-3 (5725 MHz to 5850 MHz)	
	Middle channel	
	76124	

12.9 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The limits are re-calculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 8.2 setup C
Measurement uncertainty:	See chapter 9

Limits:

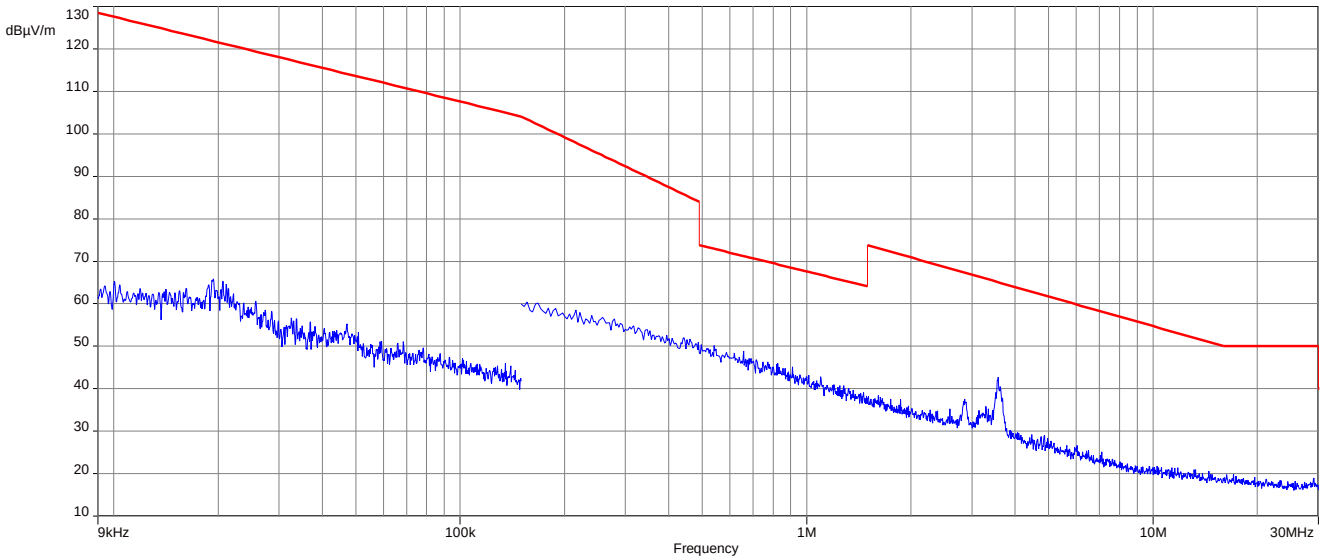
Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		

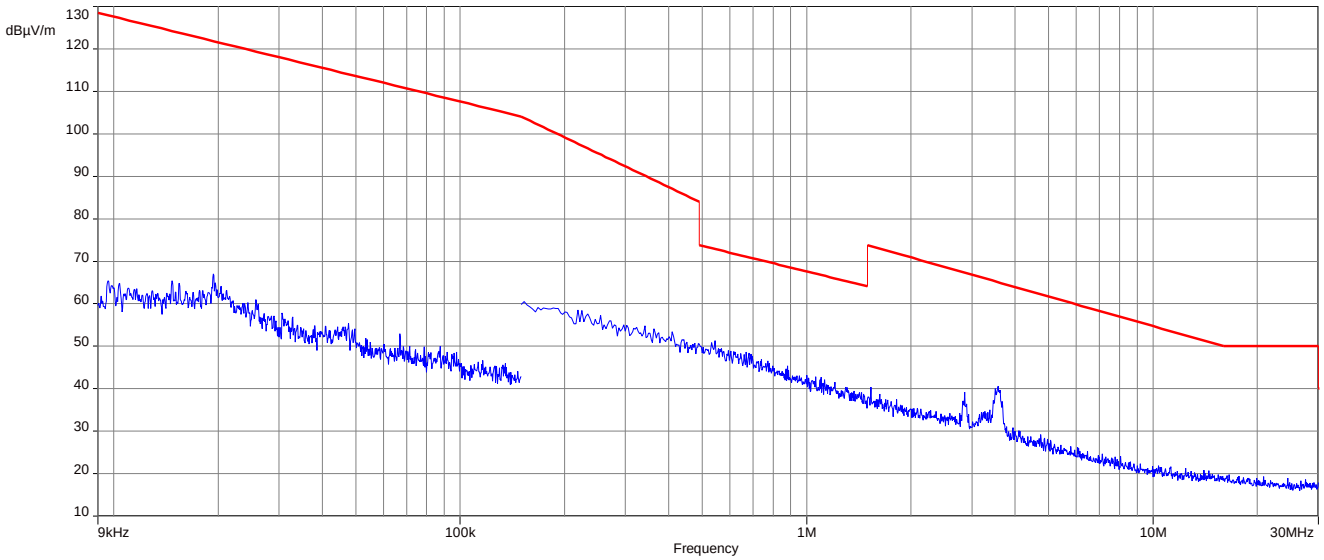
Plots: 20 MHz channel bandwidth

Plot 1: 9 kHz to 30 MHz, U-NII-3; lowest channel



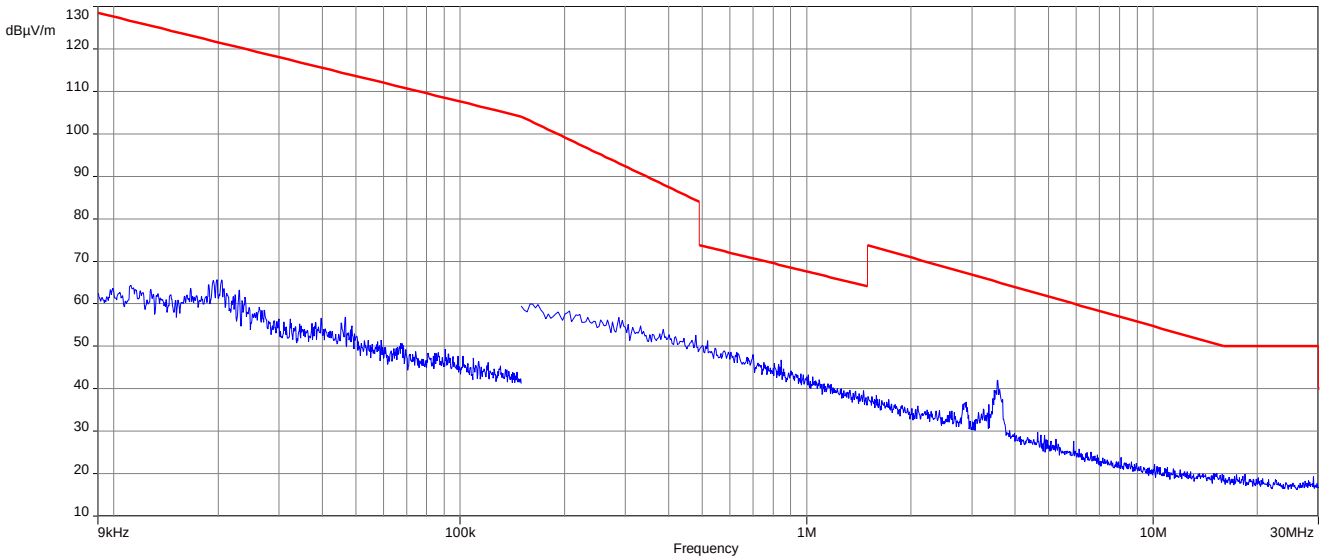
Plots: 40 MHz channel bandwidth

Plot 1: 9 kHz to 30 MHz, U-NII-3; lowest channel



Plots: 80 MHz channel bandwidth

Plot 1: 9 kHz to 30 MHz, U-NII-3; middle channel



12.10 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement:

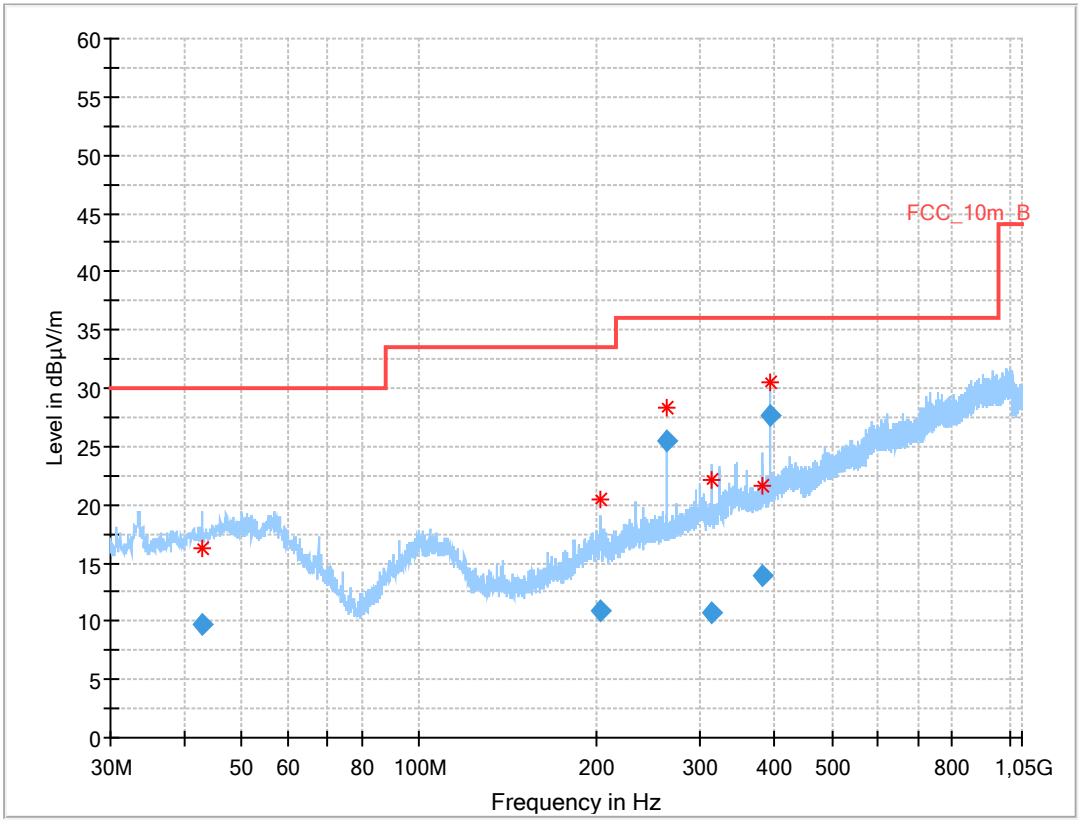
Measurement parameter	
Detector:	Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	120 kHz
Video bandwidth:	500 kHz
Span:	30 MHz to 1 GHz
Test setup:	See sub clause 8.1 setup A See sub clause 8.2 setup B See sub clause 8.3 setup A
Measurement uncertainty:	See chapter 9

Limits:

TX Spurious Emissions Radiated		
§15.209 / RSS-247		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3
§15.407		
Outside the restricted bands!	-27 dBm / MHz	

Plots: 20 MHz channel bandwidth

Plot 1: 30 MHz to 1 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

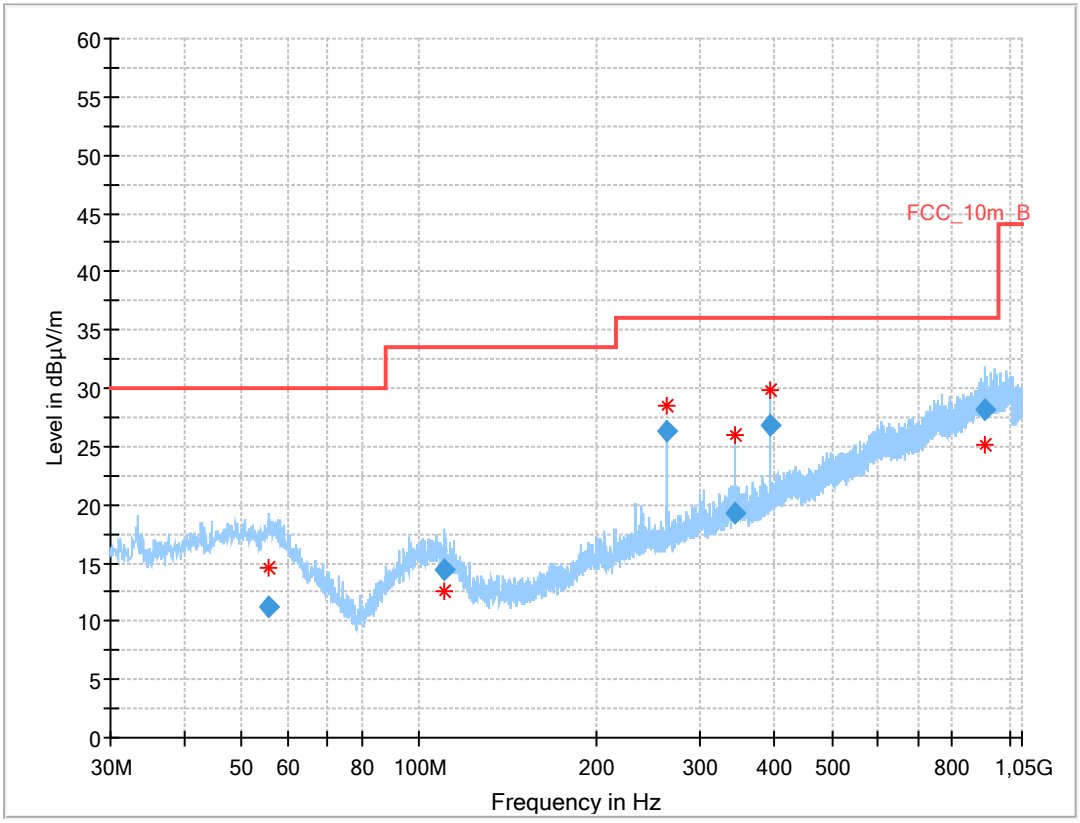


Results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
43.001	9.75	30.0	20.3	1000	120.0	125.0	V	307	14
203.098	10.96	33.5	22.5	1000	120.0	400.0	V	-45	11
262.647	25.47	36.0	10.5	1000	120.0	298.0	V	293	13
313.590	10.71	36.0	25.3	1000	120.0	200.0	H	272	14
381.870	13.86	36.0	22.1	1000	120.0	149.0	V	225	16
393.972	27.62	36.0	8.4	1000	120.0	137.0	V	180	17

Plots: 40 MHz channel bandwidth

Plot 1: 30 MHz to 1 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

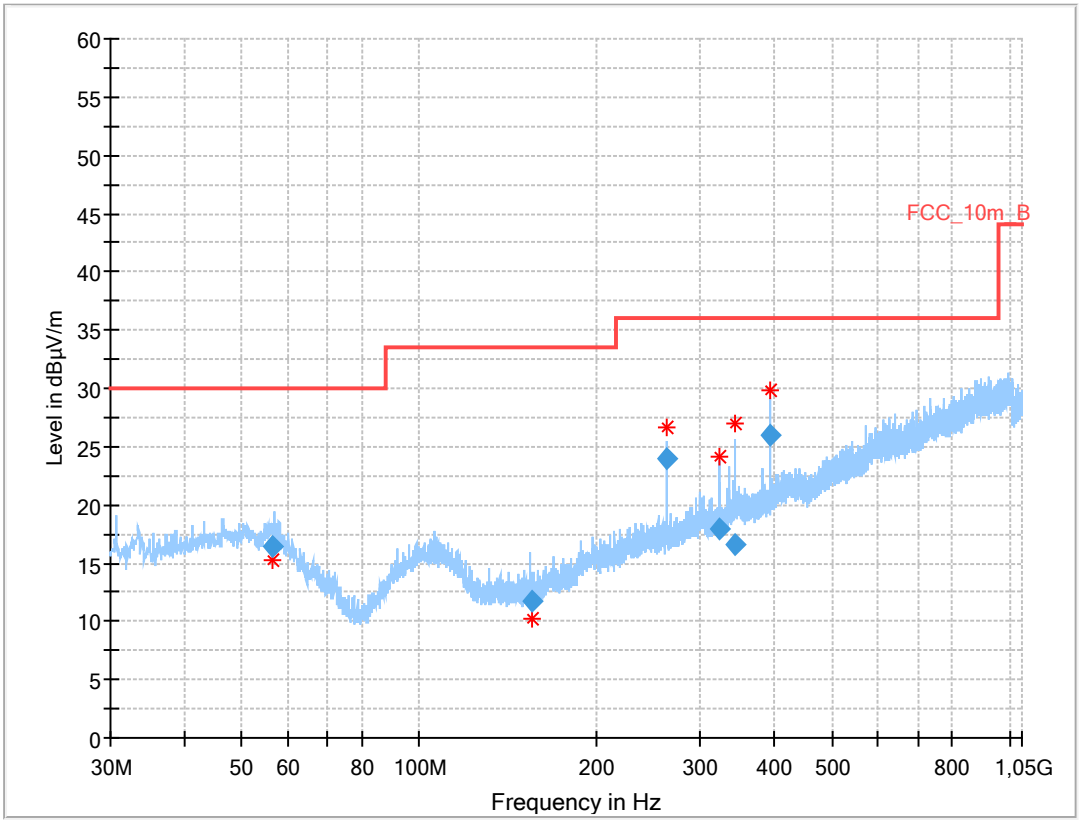


Results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
55.400	11.18	30.0	18.8	1000	120.0	131.0	H	22	15
110.298	14.39	33.5	19.1	1000	120.0	151.0	H	67	12
262.647	26.34	36.0	9.7	1000	120.0	170.0	V	292	13
343.063	19.22	36.0	16.8	1000	120.0	114.0	V	2	16
393.976	26.80	36.0	9.2	1000	120.0	98.0	V	157	17
910.908	28.08	36.0	7.9	1000	120.0	135.0	V	-22	24

Plots: 80 MHz channel bandwidth

Plot 1: 30 MHz to 1 GHz; vertical & horizontal polarization; U-NII-3; middle channel



Results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
56.452	16.39	30.0	13.6	1000	120.0	170.0	V	272	15
155.150	11.71	33.5	21.8	1000	120.0	170.0	V	67	9
262.642	23.93	36.0	12.1	1000	120.0	170.0	V	292	13
322.195	17.98	36.0	18.0	1000	120.0	170.0	V	264	15
343.068	16.59	36.0	19.4	1000	120.0	106.0	V	-1	16
393.983	26.02	36.0	10.0	1000	120.0	116.0	V	112	17

12.11 Spurious emissions radiated 1 GHz to 40 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations from 1 GHz to 40 GHz.

Measurement:

Measurement parameter	
Detector:	Quasi Peak below 1 GHz (alternative Peak) Peak above 1 GHz / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	1 GHz to 40 GHz
Trace mode:	Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 %
Test setup:	See sub clause 8.1 setup A See sub clause 8.2 setup B See sub clause 8.3 setup A
Measurement uncertainty:	See chapter 9

Limits:

TX Spurious Emissions Radiated		
§15.209 / RSS-247		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
Above 960	54.0	3
§15.407		
Outside the restricted bands!	-27 dBm / MHz	

Results: 20 MHz channel bandwidth

TX Spurious Emissions Radiated [dBµV/m] / dBm								
U-NII-3 (5725 MHz to 5850 MHz)								
Lowest channel			Middle channel			Highest channel		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected peak emissions are below the average limit.								
	Peak							
	AVG							
For emissions above 18 GHz please take look at the plots.								

Results: 40 MHz channel bandwidth

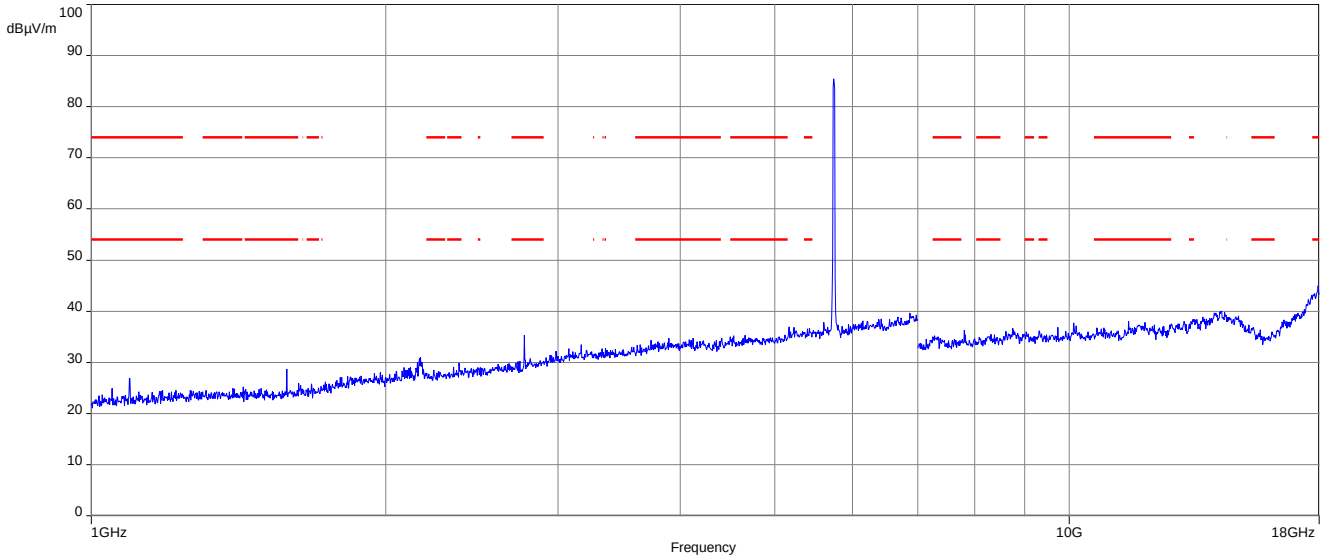
TX Spurious Emissions Radiated [dBµV/m] / dBm								
U-NII-3 (5725 MHz to 5850 MHz)								
Lowest channel			Middle channel			Highest channel		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected peak emissions are below the average limit.								
	Peak							
	AVG							
For emissions above 18 GHz please take look at the plots.								

Results: 80 MHz channel bandwidth

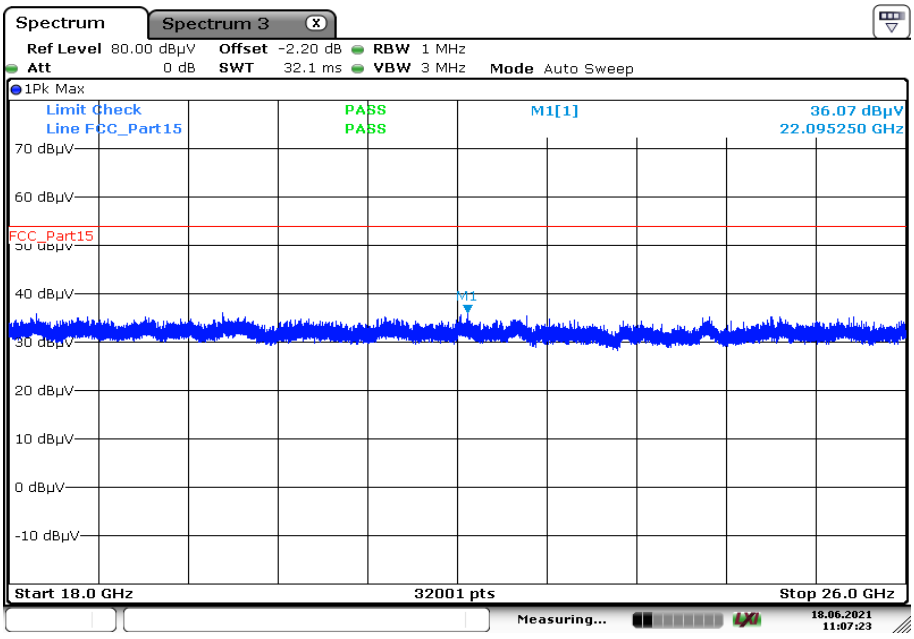
TX Spurious Emissions Radiated [dBµV/m] / dBm		
U-NII-3 (5725 MHz to 5850 MHz)		
Middle channel		
F [MHz]	Detector	Level [dBµV/m]
All detected peak emissions are below the average limit.		
	Peak	
	AVG	
For emissions above 18 GHz please take look at the plots.		

Plots: 20 MHz channel bandwidth

Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

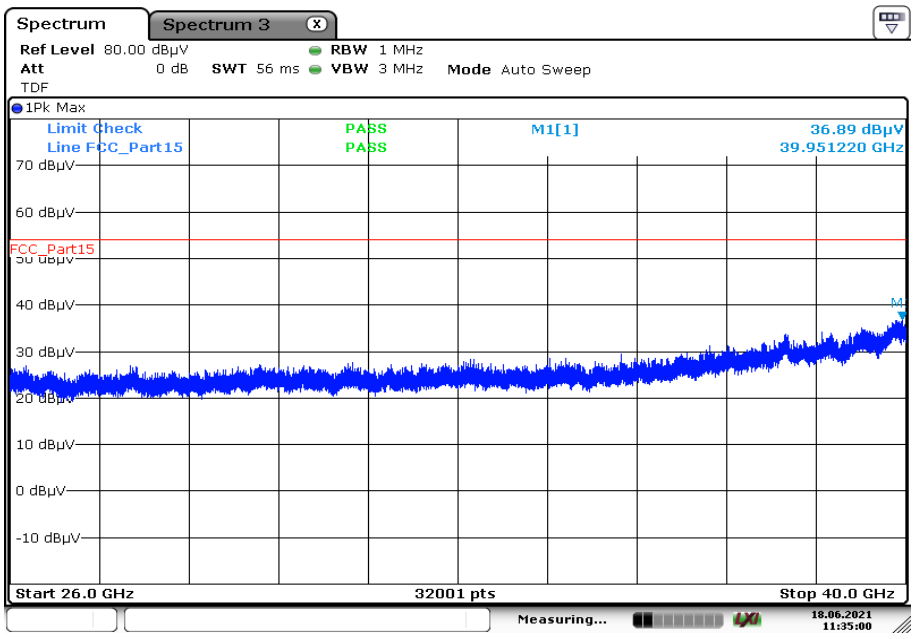


Plot 2: 18 GHz to 26 GHz; vertical & horizontal polarization; U-NII-3; lowest channel



Date: 18.JUN.2021 11:07:23

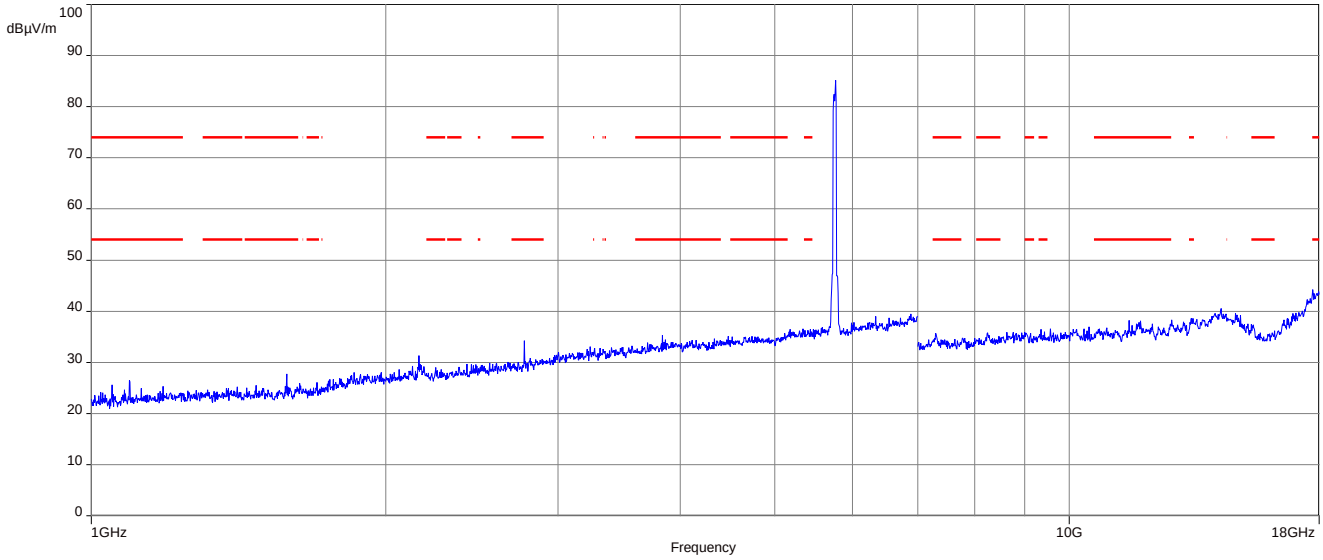
Plot 3: 26 GHz to 40 GHz; vertical & horizontal polarization; U-NII-3; lowest channel



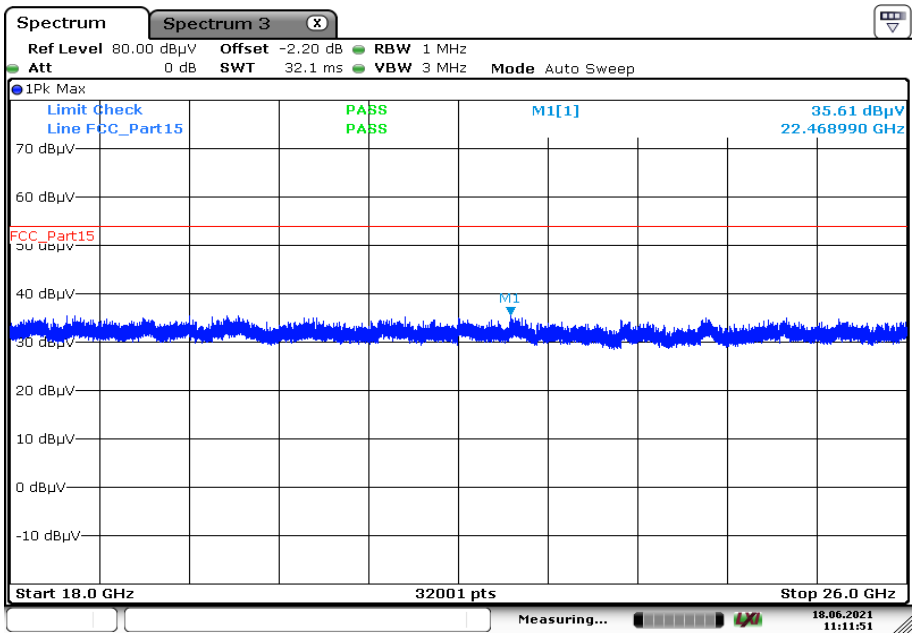
Date: 18.JUN.2021 11:35:00

Plots: 40 MHz channel bandwidth

Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

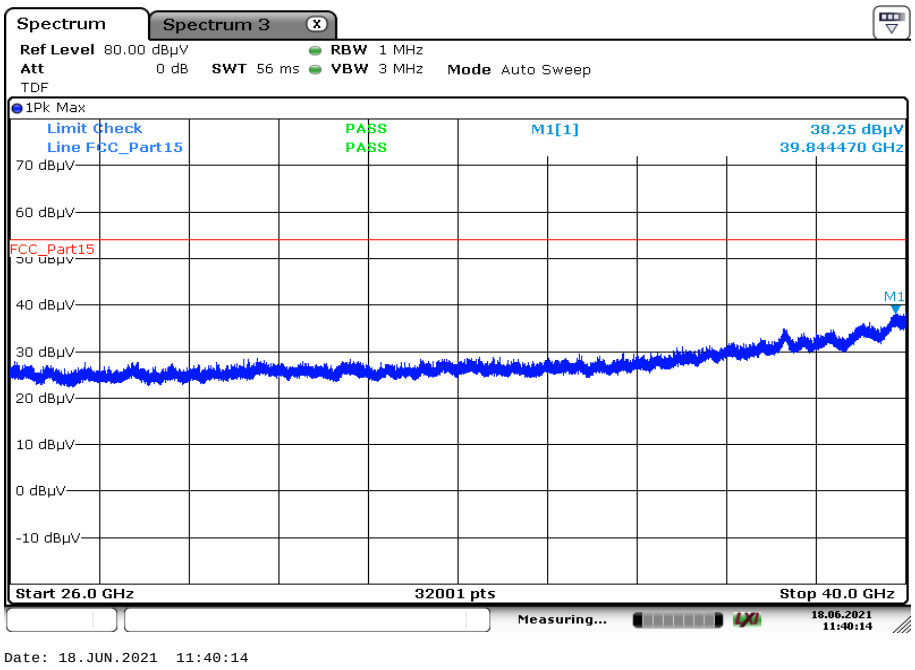


Plot 2: 18 GHz to 26 GHz; vertical & horizontal polarization; U-NII-3; lowest channel



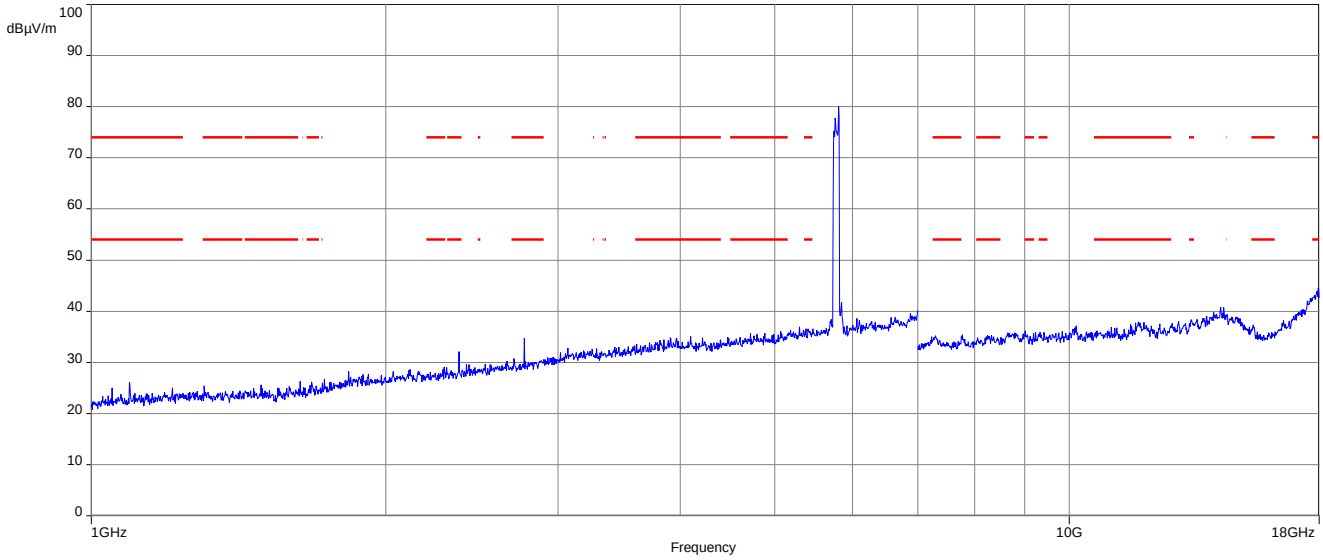
Date: 18.JUN.2021 11:11:51

Plot 3: 26 GHz to 40 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

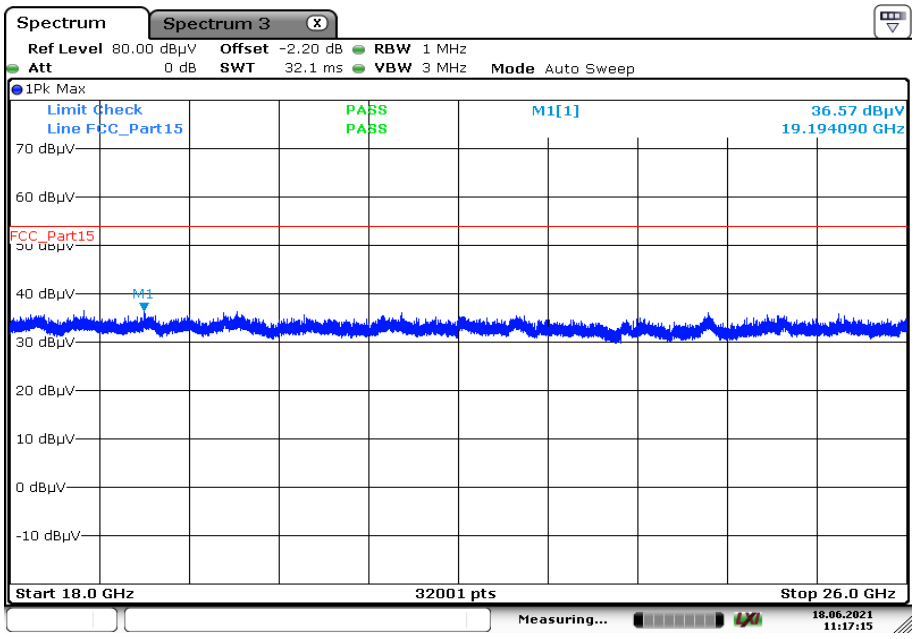


Plots: 80 MHz channel bandwidth

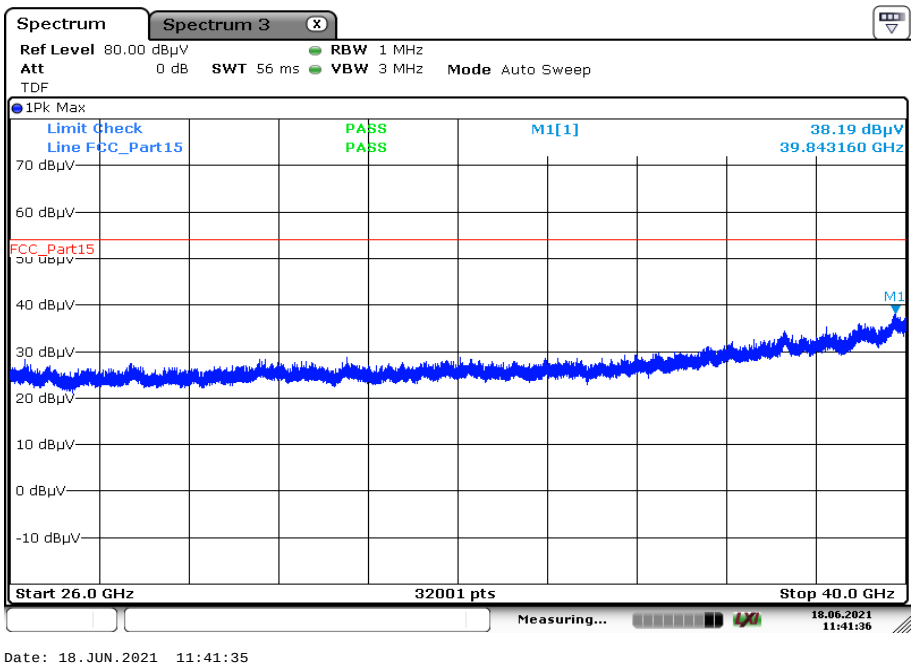
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; middle channel



Plot 2: 18 GHz to 26 GHz; vertical & horizontal polarization; U-NII-3; middle channel



Plot 3: 26 GHz to 40 GHz; vertical & horizontal polarization; U-NII-3; middle channel



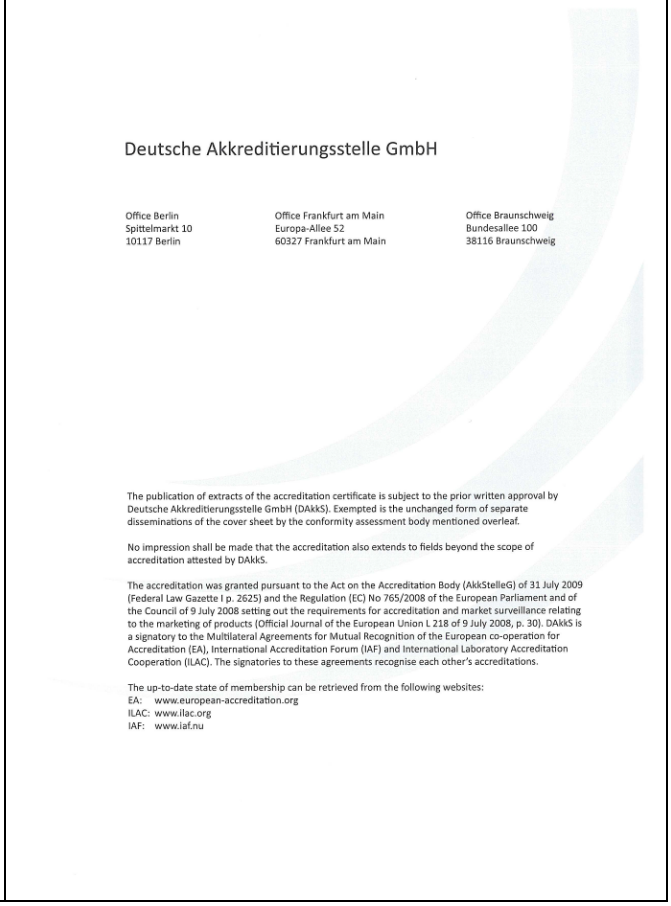
13 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

14 Document history

Version	Applied changes	Date of release
-/-	Initial release	2021-07-22

15 Accreditation Certificate – D-PL-12076-01-04

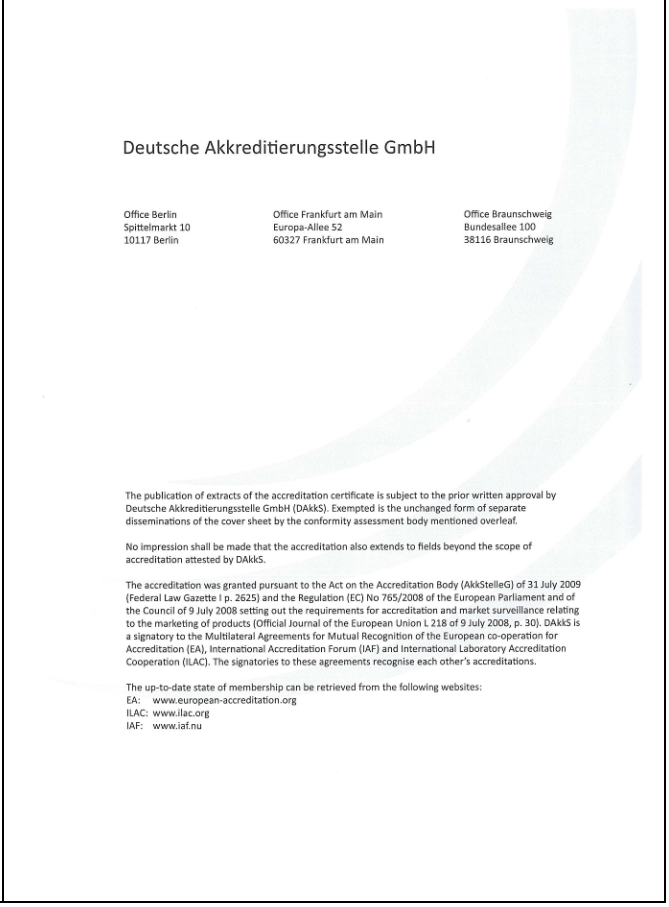
first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04.pdf
https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

16 Accreditation Certificate – D-PL-12076-01-05

first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05.pdf
https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

################################ END OF TEST REPORT ################################